



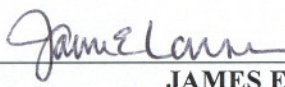
Environmental Management System Procedure
for
Monitoring and Measurement
at the
U.S. Army Garrison (USAG) Baumholder

Revision # 1

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References: a. Executive Order 13148, <i>Greening the Government through Environmental Leadership</i> . b. ISO 14001: 2004, <i>Environmental Management Systems – Specification with Guidance for Use</i> . c. EMS-Procedure # EMS_PBH_02 – <i>Determining the Significant Environmental Aspects of the Activities, Products and Services of the U.S. Army Garrison (USAG) Baumholder</i> d. EMS-Procedure # EMS_PBH_04 – <i>Developing Environmental Objectives and Targets for the U.S. Army Garrison (USAG) Baumholder</i> e. EMS Procedure # EMS_PBH_09 – <i>Control of Environmentally Relevant Documents/ Records of the U.S. Army Garrison (USAG) Baumholder</i>			

1.1 PURPOSE.

The purpose of this procedure is to provide a standard method for monitoring and measuring the key characteristics of those Garrison products, activities and services that can significantly impact the environment against the set EMS objectives and targets. The monitoring and measuring process ensures environmental performance is consistent with the Garrison's Policy and encourages continual improvement by highlighting both successes and areas needing improvement.

1.2 APPLICABILITY.

This procedure applies to all personnel within the installations of USAG Baumholder, whose work may create a significant impact on the environment and those persons involved in monitoring the performance of products, activities and services within the USAG Baumholder's installations.

1.3 DEFINITIONS

Cross-functional Team (CFT) — A group of individuals from across the Garrison, appointed either by the Garrison Commander or senior leadership, who will coordinate the support necessary for EMS implementation and are responsible for implementing the EMS Garrison-wide.

Environmental Aspect — The part of an activity, product, or service that interacts with the environment.

Environmental Impact — Any change to the environment that is caused by an environmental aspect.

Key Characteristics — Objective, measurable and verifiable environmental performance indicators of an activity, product or service. These indicators are to be considered for managing significant aspects, achieving objectives and targets, and to improve environmental performance.

Media Manager — An individual who manages and provides overall oversight to one or more media areas. Media managers are not restricted to the Environmental Management Office.

2. PROCEDURE

STEP 1: Identifying relevant products, activities and services and their key characteristics

The media managers shall identify which products, activities and services are related to the USAG Baumholder's environmental objectives and targets (EMS procedure # EMS_PBH_04) and its significant aspects (EMS procedure # EMS_PBH_02). They shall then determine the environmental key characteristics of these products, activities and services.

The Directorate of Public Works Environmental Management Office (DPW EMO), Cross-functional team (CFT), and product/activity/service supervisors will assist the media managers, if needed.

The following table gives some examples for aspects and key characteristics:

Aspect	Example key characteristics
Energy consumption (electrical energy)	Quantity, costs
Spills and leaks (POL)	Spill volume, type of spill (unique, recurrent), approximate time before spill was detected and removed, costs for spill removal
Hazardous waste generation (POL)	Quantity, quality/contamination rate, disposal costs, costs for USTs and ASTs
Solid waste generation (domestic)	Segregation rate, quantities of the different waste streams, disposal costs, amount of complaints due to aesthetic problems at recycling points and storage areas
Wastewater generation (process wastewater)	Wastewater volume, pollutant loading, costs of treatment/discharge

The following examples illustrate this:

Example 1:

Aspect: Stormwater handling (stormwater discharge)

Objective: Bring stormwater discharge at Garrison-level into compliance with legal and other requirements.

Target: Implement a stormwater-monitoring program that meets the requirements of the discharge permits by December 2005.

A. Which products, activities, or services are affected?

Make a list of all facilities that directly discharge stormwater. Check, which of these facilities do have a permit. Check the permit requirements for each.

If some of the facilities do not have a permit, check if they need a permit, and apply for one, if necessary.

B. *Determine the key characteristics of these products, activities, or services.*

In this case, the key characteristics are the permit requirements – which generally are chemical or physical properties of the discharged water, such as pH, BOD(biological oxygen demand), COD (chemical oxygen demand), concentration of hydrocarbons, temperature, color, turbidity, odor, plus a probing schedule – and record keeping practices.

Key characteristics were determined as pH (6,5 - 8,5), hydrocarbons concentration (≤ 10 mg/l), COD (≤ 150 mg/l) and BOD (≤ 40 mg/l), all measured monthly.

Example 2:

Aspect: *Solid waste generation (domestic)*

Objective: *Reduce environmental risk of solid waste generation*

Targets: a) *Reduce quantity of residual waste generated by 15% by September 2006 by increasing recycling rate.*
 b) *Improve quality of segregated recyclables.*

A. *Which products, activities and services are affected?*

Make a list of all generators of solid waste (domestic), such as housing areas, dining facilities or schools.

B. *Determine the key characteristics of these processes, activities, or services*

Check, if in the past there have been specific problems concerning solid waste handling at any of these facilities. This could e.g. be mixing recyclables with residual waste, misuse of recycling areas, or overloading waste bins.

Keeping in mind this information, develop the key characteristics you want to measure/monitor, such as waste quantity, waste disposal costs, recycling rate, number of complaints concerning the condition of recycling areas, number of incident reports by the contractor disposing the waste, results of visual checks performed by DPW, etc.

The following key characteristics were determined:

- *Disposed waste amount (kg/per Person and year) for residual waste and recyclable waste*
- *Disposal costs*
- *Recycling area inspection logs*
- *Number and quality of complaints by the disposing contractor*

STEP 2: Determining monitoring and measurement status

The media managers shall determine the monitoring and measurement status of the key characteristics of the processes, activities, and services determined in STEP 1.

For doing this, check if there are already any monitoring or measurement methods in place for the key characteristics.

If this is the case, check if these methods meet the requirements specified below. If it does, go on to STEP 5.

If there is not such a method, or the method available does not meet the following requirements, continue with STEP 3.

The requirements for a monitoring/measurement method are:

- Are all key characteristics determined in STEP 1 monitored/measured?
- Is the frequency of the monitoring sufficient to comply with legal and other requirements?
- Is the method sufficient to provide accurate and reliable data?
- Is the method sufficiently documented (e.g. SOP)?
- Does the method allow conclusions with regard to environmental performance?

In the SOP for the monitoring/measurement method the following issues shall be clarified:

- How shall the monitoring be conducted?
- Who is responsible for conducting the monitoring?
- What is the monitoring schedule?
- How and where will the required results be documented?
- Who gets copies/summaries of the data?
- How is it ensured that the manuals for the measuring equipment are available?
- What is the schedule for the calibration?
- Who is responsible for equipment calibration and maintenance, and documenting calibration?
- How is it ensured that the personnel involved in calibration, measuring and monitoring are sufficiently trained? Who is responsible for the training? How will training be documented?

For Example 1 and the target 'Implement a stormwater-monitoring program that meets the requirements of the discharge permits by December 2005.' the STEP 2 analysis showed:

- *There is already a monitoring program in place, that measures all key characteristics,*
- *the frequency of the monitoring is sufficient,*
- *the method provides accurate and reliable data,*
- *the method provides conclusions with regard to environmental performance*
- ***but** since the method is not sufficiently documented (there is no SOP, and only one person knows about/uses the informal method, there is no substitute and no supervisor to this person), it is no clear, if the data are reliable.*

For Example 2 and the target 'Reduce quantity of residual waste generated by 15% by September 2006 by increasing recycling rate the STEP 2 analysis showed:

- *There is no SOP for measuring the key characteristics.*
- *The only data available on the key characteristics disposed waste amount (kg/per Person and year) for residual waste and recyclable waste are the invoices of the contractor who disposes of the waste. The contractor sends these invoices once per month.*
- *Currently, there are no checks if the contractor adequately addresses recyclables and no regular inspections of the recycling areas.*
- *The DPW does not keep statistics on the number and topic of complaints of the disposing contractor, but just pays whatever the contractor invoices as additional amounts and/or additional services necessary.*
- *There are rumors that the contractor tends to declare recyclables 'residual waste' as soon as the recyclables containers show any indication of misuse.*

STEP 3: Developing monitoring and measuring methods

The media managers will develop monitoring and measurement methods (SOP's) that meet the requirements specified in STEP 2 for all products, activities and services related to the USAG Baumholder's objectives and targets and its significant environmental aspects.

I.e. once the key characteristics are identified (STEP 1), the media managers need to determine how they can be measured. Doing so, they shall not only consider using direct measurement methods, such as measuring waste amounts (in tons), or pollutant concentrations (in g/l), but also indirect measurement methods. Indirect measurement could e.g.: include checking record keeping at the affected site, checking incident reports, conducting interviews with site personnel, or monitoring if operational controls (e.g. SOPs) are followed.

The SOPs developed by the media managers need to be approved by the EMO before implementation. The EMO shall present the finalized SOPs to the CFT.

For Example 1 the media manager and the person currently performing the monitoring sit together and write down the method that has already been used and include sections on equipment calibration, review and distribution of the measurement results, training requirements, and determine a revision schedule for the procedure. In addition, a substitute for the person currently performing the monitoring is appointed. The new procedure is reviewed by the EMO prior to implementation.

For Example 2 the media manager and the person controlling the invoices sit together and develop an SOP addressing all key characteristics. In addition, a checklist for inspections of the recycling areas is developed. It is intended that implementing the SOP will lead to reliable data on the question to which amount and for which reason the contractor needs to dispose waste that could normally be recycled, and if these instances can be minimized. The new procedure is reviewed by the EMO prior to implementation.

STEP 4: Allocation of equipment and training

Personnel that conduct the monitoring/measurement must be provided with appropriate equipment and adequate training. Equipment status and personnel qualification have to be

checked regularly by the media managers. The results of these checks must be documented and reported to the EMO/CFT.

In case the media managers cannot provide the required equipment and training other funding opportunities must be found.

For Example 1 the person currently performing the monitoring has not attended training since 10 years, and got the measurement equipment by incidence after another installation was closed down. The media manager decides to send the equipment to the manufacturer for checking and calibration. After the manufacturer has confirmed that the equipment is o.k., the person who has performed the monitoring in the past and the new substitute attend a training session on the equipment and its calibration at the manufacturer's training center. After these tasks are completed, the media manager informs the EMO/CFT about completion.

For Example 2 it is essential that the aims of the new SOP and checklist are clearly communicated to all DPW personnel involved. Therefore, a training session is held. In addition, the person controlling the contract/invoices of the disposing contractor takes training on the necessary skills for filing data retrievably and preparing statistical data. After these tasks are completed, the media manager informs the EMO/CFT about completion.

STEP 5: Implementing monitoring and measurement methods

The monitoring/measurement must be conducted on a regular basis as described in the SOP. The monitoring/measurement results must be documented and be available to the media managers, the EMO and the CFT.

For Example 1 the person performing the monitoring keeps records of the monitoring results and sends a copy to the media manager who checks them for conformance with the SOP. He provides quarterly status reports on his findings to the EMO, and provides the EMO and CFT with copies of the data on request.

For Example 2 the person controlling the contract/invoices collects all data on:

- *disposed waste amount (kg/per Person and year) for residual waste and recyclable waste,*
- *disposal costs,*
- *recycling area inspections,*
- *number and quality of complaints by the disposing contractor,*

The above data is appropriately documented and filed, and statistics are performed on them.

STEP 6: Analysis of monitoring/measurement results

The obtained results have to be analyzed and interpreted by the media managers. The results of this analysis shall be discussed with the EMO and CFT.

The analysis shall answer questions such as:

- Do we comply with legal and other requirements?

- What is the crucial factor for bad environmental performance or non-compliance?
- How is environmental performance developing?
- Are there further opportunities to improve of environmental performance?

In general it should be taken into consideration, that the analysis of monitoring and measuring results is to be conducted early enough, so that changes can be applied in order to meet the objectives and targets, if needed.

The following examples shall demonstrate such an analysis:

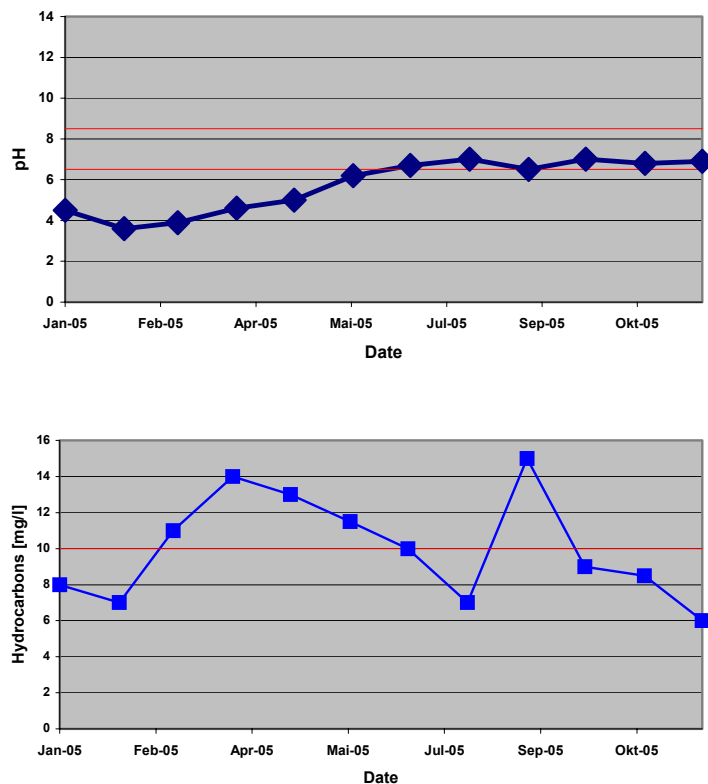
Example 1: Stormwater discharge monitoring results

Key characteristics were determined as pH (6,5 - 8,5), hydrocarbons concentration (≤ 10 mg/l), COD (≤ 150 mg/l) and BOD₅ (≤ 40 mg/l), all measured monthly.

	pH	Hydrocarbons [mg/l]	BOD [mg/l]	COD [mg/l]
1/1/2005	4.5	8	38	130
2/1/2005	3.6	7	40	135
3/1/2005	3.9	11	36	135
4/1/2005	4.6	14	25	130
5/1/2005	5	13	30	129
6/1/2005	5.9	11.5	33	135
7/1/2005	5.4	10	35	140
8/1/2005	5.8	7	40	135
9/1/2005	6	15	40	133
10/1/2005	4.5	9	40	129
11/1/2005	6	8.5	36	125
12/1/2005	6.5	6	35	132

Figure 1: Measuring results for 2005

For analyzing the data the following charts were created:



Analysis of the table and charts shows:

- In 2005, the BOD₅ and COD never exceeded the limit values set in the discharge permit.*
- The pH has adjusted to 6.5 – 8.5, as required by the discharge permit.*
- The concentration of hydrocarbons exceeded the limit value set in the discharge permit from March until June and again in September.*

In sum, this means, discharge is not in compliance with the discharge permit. The crucial factor for non-compliance is the hydrocarbons concentration. There has been improvement concerning pH.

This poses the following questions/tasks:

- What was the reason for the concentration of hydrocarbons exceeding the limit value?*
- What can be done to avoid this?*

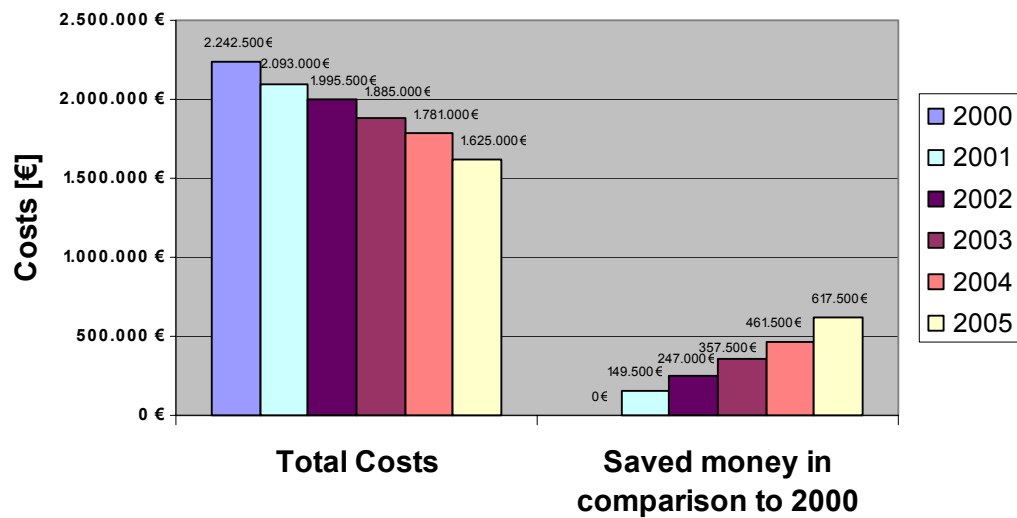
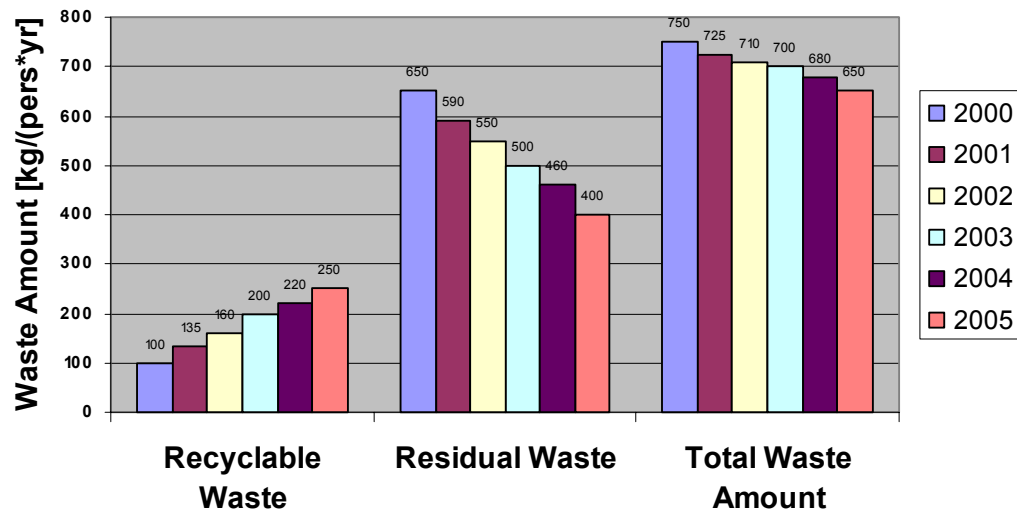
Example 2: Reduction of residual waste

The following key characteristics were determined:

- Disposed waste amount (kg/per Person and year) for residual waste and recyclable waste*
- Disposal costs*
- Recycling area inspection logs*
- Number and quality of complaints by the disposing contractor*

The following data was collected:

Year	Number of DPW findings concerning the recycling areas	Number of complaints by disposing contractor
2000	120	25
2001	111	22
2002	90	20
2003	103	23
2004	56	10
2005	30	6



Analysis of the table and charts shows:

- a) The situation at the recycling areas is getting better. Internal checks show less problems.*
- b) The control and improvement of waste segregation caused a decrease of complaints by the disposing contractor.*
- c) The amount of residual waste decreased from the year 2000 to 2005 by nearly 40%.*
- d) The disposing costs continuously decreased. The disposal costs in 2005 were 617.500 € less than in 2000.*

In sum, this means that the solid waste and recycling program implemented in 2000 is working fine. It is adequate for reaching the objectives and targets. Still, the potential for further improvement should be evaluated.

STEP 7: Updating

Use the results of STEP 6 for adapting objectives and targets and environmental programs, SOP's and other applicable documents, if needed.

For Example 1 upon the results of STEP 6, the CFT decides to set new objectives and targets and establish a program to reduce hydrocarbon contents of the stormwater discharged.

For Example 2 the CFT decides to continue using the tools developed for reaching the targets, because they have proved to be efficient for improving the recycling rate and reducing the waste amounts. The CFT decides not to set additional targets on the aspect "Solid waste generation (domestic)", but to work on another aspect in the next year. They still ask the media manager responsible for solid waste generation to regularly report the statistics prepared under the Solid Waste SOP to the CFT to keep them informed.

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APPENDIX A

Monitoring and Measurement Flow Chart

